I++ DME
The Specification
The Implementation

Josef Resch
Carl Zeiss Industrial Metrology
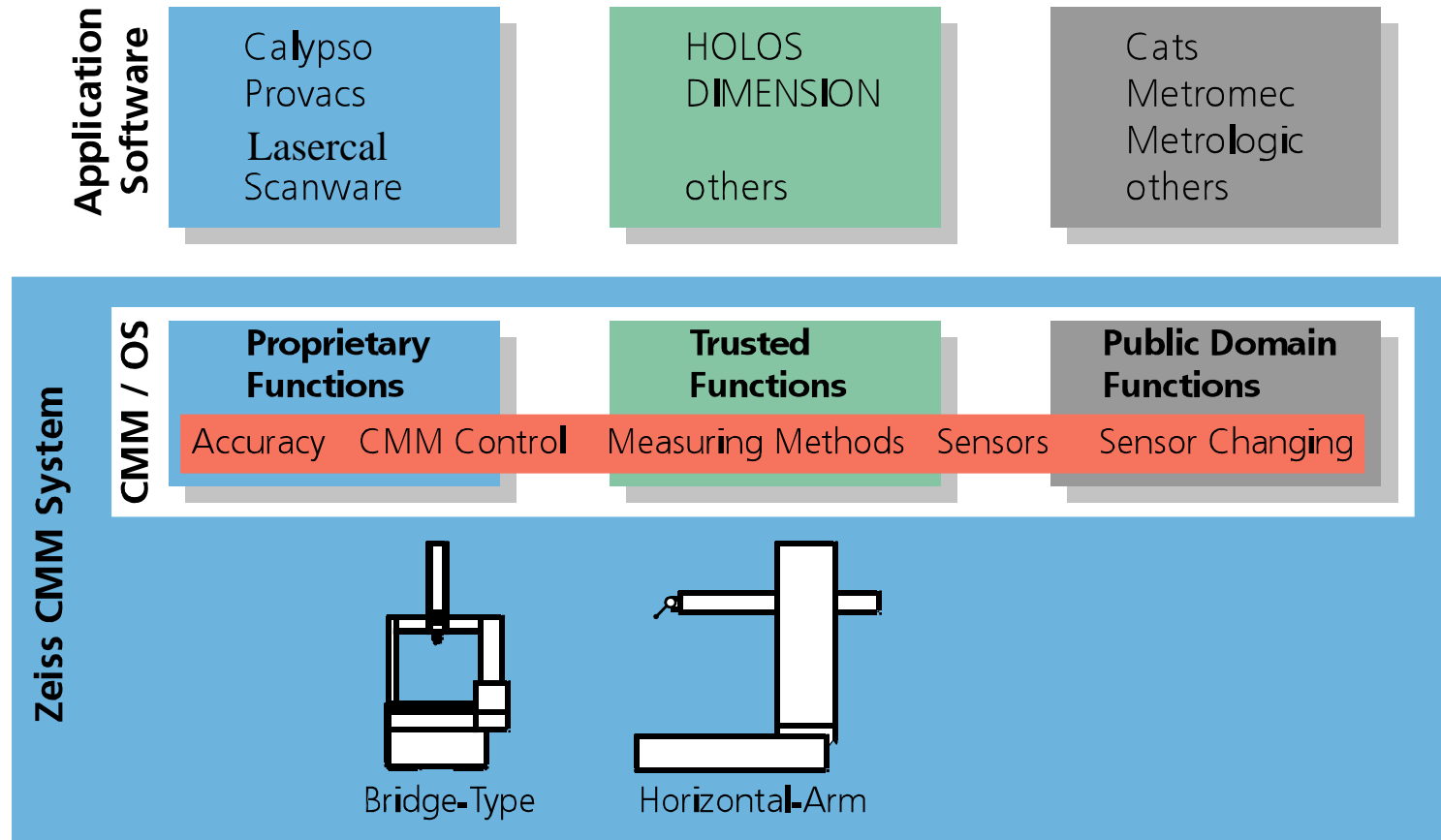
Agenda

- The Roots

- The Definition

- Public Relations
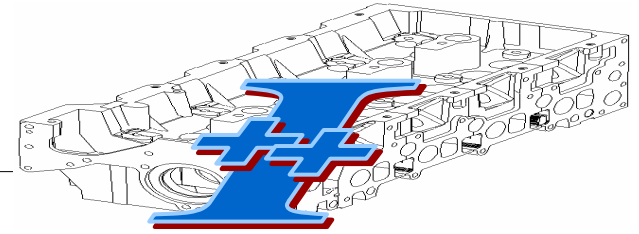
- The Implementation and the Testing

- Experiences

Josef Resch
CMM Operating Systems
Carl Zeiss IMT GmbH

Zeiss Open Software Interface

Application Software

| Calypso Provacs Lasercal Scanware | HOLOS DIMENSION others | Cats Metromec Metrologic others |

Zeiss CMM System

CMM / OS

| **Proprietary Functions** | **Trusted Functions** | **Public Domain Functions** |

Accuracy   CMM Control   Measuring Methods   Sensors   Sensor Changing

Bridge-Type   Horizontal-Arm

Josef Resch
CMM Operating Systems
Carl Zeiss IMT GmbH

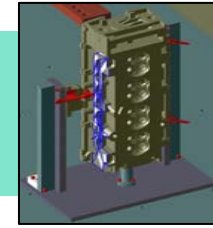# I++: Our goals for the future
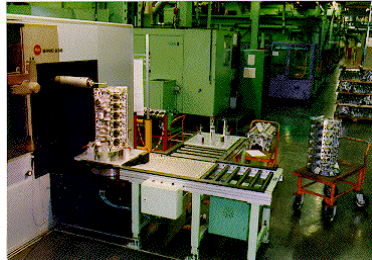
Different CAD - systems

I++

Inspection software

I++ DME

I++

Different Reporting systems

Agenda

- The Roots

- The Definition

- Public Relations

- The Implementation and the Testing

- Experiences

- Clear separation of application software and machine near technology and sensor complexity

- Encapsulation of machine and sensor functionality on the DME server side

- Separation results in a clear responsibility when problems occur. Monitors do the rest

- Asynchronous dialogue between client and server

- Usage of common robust interface technology. ASCII strings via TCP/IP sockets

■ Object oriented approach for structuring

■ Separation between Object Model and Interface

■ Tags for all commands from the client to the server. All answers, measuring results… and error messages refer to this

■ For all command an acknowledge and a ready message

■ 2 Input queues for commands. Normal and fast or event

■ Structurized error messages

■ Daemons for periodical responses/events from the server

■ Defined namespaces for development

DME – The Definition Steps

Done:

1.0 Touch trigger probes including articulation head
Released Feb. 2002.

1.1 Multiple arms
Released June 2002.

1.2 Scanning, hints, collision handling

1.3 Rotary table
Released Dec. 2002. Versions 1.2 and 1.3 have been merged to 1.3.

1.3.1 Aug. 2003, including addings according comments of implementers

1.4 Form testers
Released Jan. 2004, including addings according comments of implementers

1.4.1 and 1.4.2 including addings according comments of implementers

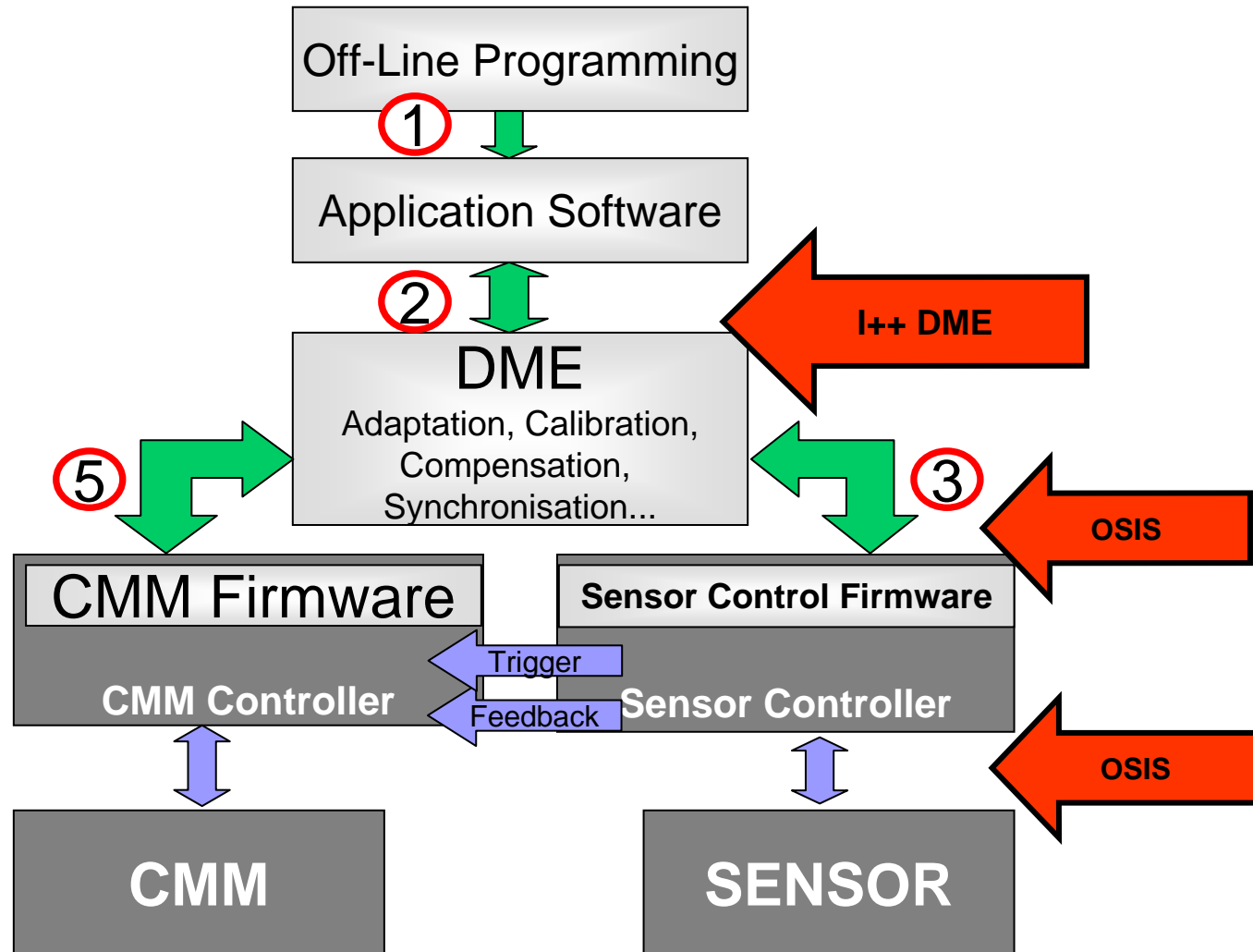**1.4.3 Released Aug. 2005, including ScanPar, ScanOnCurve…**

1.5 Tactile Tool Handling completion
Released Nov. 2005, including
ToolCollectionHandling, PtMeasSelfcenter, ToolTypeId, Temperature Sensor handling

Planned:

2.0 Optical sensors

■ The relationship to OSIS

■ The relationship to DMIS

Off-Line Programming

1

Application Software

2

I++ DME

DME
Adaptation, Calibration, Compensation, Synchronisation...

5

3

OSIS

CMM Firmware

Sensor Control Firmware

Trigger

CMM Controller

Feedback

Sensor Controller

OSIS

CMM

SENSOR

Similar, Harmonic:

- Separation of object model and interface technology

- Handling of main commands and properties

- Naming conventions

- Error information, structure, severity, numbers...

- ... Value for quality of measurement...

- Description, object model, use cases...

- Structure of Specification

- But…

Past Situation

- DMIS describes partially sensor complexity

- DME encapsulates sensor complexity

- I++ requests to modify DMIS in some areas

- DMIS implementers request some add-ons in DME

Change Request Process

• Several Meetings done

• Status paper of DME strategy published

• Additional requests handled by add-ons in DME

• Change Requests for DMIS defined and on the way via EDUG

Agenda

- The Roots

- The Defintion

- Public Relations

- The Implementation and the Testing

- Experiences

Josef Resch
CMM Operating Systems
Carl Zeiss IMT GmbH

- October 1999, First meeting of the I++ DME group

- July 2000, Frankfurt, Information of vendors about I++ and DME

- October 2000, Munich BMW, presentation of interface concept

- February 2001, Munich BMW, vendor commitment for implementation

- October 2001, Untertürkheim, meeting with MAA

- December 2001, Stuttgart-Echterdingen, first developer workshop

- February 2002, Release of DME 1.0

- February 2002, one of several IA.CMM data technique meetings

- April 2002, Untertürkheim, meeting with Bob Waite to define NIST activities

- April 2002, Visit AIAG, NIST, MAA USA with IA.CMM management

- June 2002, Release of DME 1.1

- July 2002, Frankfurt, second developer workshop

- October 2002, NIST provides I++ Test bed

- December 2002, Release of DME 1.3

- Support of implementers (Server and client) direct
- Biweekly telephone conferences with NIST and the implementers
- Interoperability tests
- July 2003, DME Spec. 1.3.1.draft including changes acc. Comments
- Jan 2004, DME Spec 1.4
- April 2004 2 day workshop airport Echterdingen, 2nd day DMIS
- July 2004 generating list of all comments to support implementations
- July 2004 generating DME Spec 1.4.2
- Biweekly telephone conferences with NIST and the implementers
- Interoperability tests
- Sept 2004, IMTS Chicago, first interoperability demonstration and conference
- March 2005, harmonization meeting for DMIS with EDUG members in Pfronten
- May 2005, interoperability show and workshop at Control in Sinsheim
- Spring 2006, preparation for Interoperability on Control again

- Not reported the many meetings and telephone conferences with the DME-Specification Team

Agenda

- The Roots

- The Definition

- Public Relations

- The Implementation and the Testing

- Experiences

Short Comments

- Most implementations in common software packages

- Implementation support by C++ files from NIST

- Test support by NIST test files and artifacts

- Should be actualized

- Otherwise following bilateral intensive tests necessary

■ First IMTS 2004 Chicago

| Metrologic | **Tecnomatix** | Wilcox | LK | Metromec | Zeiss |

HUB

DME

Zeiss

Hexagon Dea

Wenzel
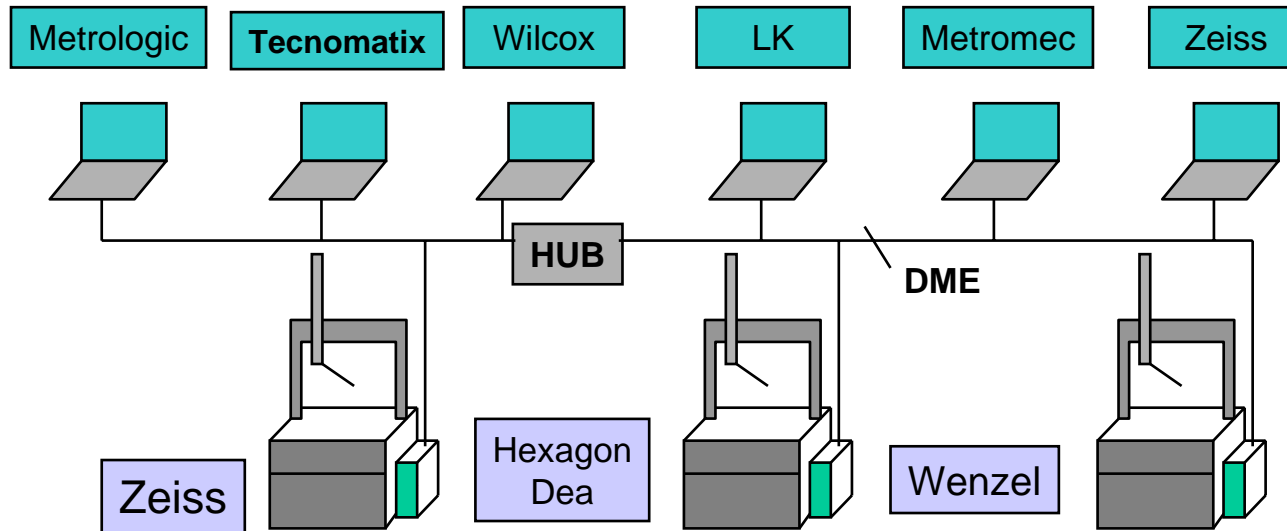
■ Second 2005 Quality Chicago

■ Third 2005 Control Sinsheim

■ Forth planned 2006 Control Sinsheim

Agenda

- The Roots

- The Definition

- Public Relations

- The Implementation and the Testing

- Experiences

From Rene Keller (Metrosoft), Michel Penlea (Wilcox), Chiratatna Pot (Tecnomatix)

■ A DME client has not to deal with the specialities of a CMM. It has to send only the request for points and scans

■ It is not necessary to support hundreds of drivers. Only one interface for more CMMs

■ The development can be separated well to steps. First touch trigger … scanning … rotary table

■ It is different to grow in or to define strategic

■ Grown experience with CMM-OS very helpful

■ Approach in DME to be more abstract in sensor technique is challenging

■ Working in a group of 4 – 5 specialists seems to be the most effective way

■ Information must be done

■ Information exchange to the world must be done

■ Harmonization and synchronization to other initiatives is sense full and necessary, OSIS, DMIS, INTRAC

- A test bed very helpful to check interoperability

- Interoperability demos harmonize and synchronize, speed up

- The defined functionality is working according done implementations and tests

- The work is not done yet…

    - Spec
    - Implementation
    - Tests

Thanks for your Attention